

MORPHOLOGICAL STUDY OF INTERNAL ILIAC ARTERY

Pavan P Havaladar *¹, Sameen Taz ², Angadi A.V ³, Shaik Hussain Saheb ⁴.

^{1,4} Assistant Professors Department of Anatomy, JJM Medical College, Davangere, Karnataka, India.

² Assistant Professors Department of Anatomy, Sri Devaraj Urs Medical College, Kolar, Karnataka, India.

³ Professor & Head, Department of Anatomy, SSIMS & RC, Davangere, Karnataka, India.

ABSTRACT

Background: The internal iliac artery is the “artery of the pelvis”. It supplies most of the blood to the pelvic viscera, gluteal region, medial thigh region and perineum. A severe and potentially lethal complication in pelvic surgeries is arterial bleeding commonly involving the branches of internal iliac artery. While operating on pelvic organs, the knowledge of internal iliac artery and its variations is important for surgeons. The present study was conducted to study of morphology of internal iliac artery.

Methods: 50 adult human pelvic halves were procured from embalmed cadavers of J.J.M. Medical College and S.S.I.M.S & R.C, Davangere, Karnataka, India for the study.

Results: The classification of branching pattern of internal iliac artery was based on modified Adachi classification. Out of the 50 specimens studied, Type Ia arrangement was found in 52% of the specimens, Type III in 34%, Type IIa and type V was found in 2% each, Type IV was not found in any of the specimens and 10% of the specimens could not be classified because of the absence of inferior gluteal artery in them. Adachi Type Ia arrangement was the most frequent finding. The obturator artery took origin most frequently from the anterior division of internal iliac artery. Middle rectal artery was not constant.

Conclusion: The internal iliac artery morphology shows multiple variation the knowledge is very helpful during pelvic surgeries.

KEYWORDS: Internal iliac artery, Obturator artery, Middle rectal artery, Internal pudendal artery.

Address for Correspondence: Dr. Pavan P Havaladar, Assistant Professor of Anatomy, JJM Medical College, Davangere -577004. India.

Access this Article online

Quick Response code



Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 17 April 2014

Peer Review: 17 April 2014 Published (O):31 May 2014

Accepted: 12 May 2014 Published (P):30 June 2014

INTRODUCTION

The distribution of the branches of a main artery is determined by functional considerations as the result of which structures taking part in a common activity tend to be vascularized by branches of the same arterial stem, functionally connected structures inevitably make simultaneous demands on the circulation and it may therefore be a matter of convenience that they should be supplied from the same source[1].

The internal iliac artery is the “artery of the pelvis”. It supplies most of the blood to the pelvic

viscera, namely; rectum, urinary bladder, prostate and seminal vesicle in male, uterus in female and musculoskeletal part of the pelvis. However, it also supplies branches to the gluteal region, medial thigh region and the perineum including erectile tissues of the penis and the clitoris[2]. Knowledge of internal iliac artery and its branching pattern is not only important for the anatomists but also for surgeons, obstetricians and gynaecologists, urologists, vascular surgeons and radiologists.

Bilateral internal iliac artery ligation is an effective life saving method to control obstetrical

and gynaecological haemorrhage and avoids a hysterectomy. While operating on pelvic organs, eg: in haemorrhoidectomy, rectal malignancies, the knowledge of internal iliac artery, its branching pattern and its variations is important for surgeons. Intractable haemorrhage during transurethral resection of prostate surgeries can be controlled by ligation of internal iliac artery, where no definitive bleeding point is detectable. Angiographically directed arterial embolisation is very effective in controlling the haemorrhage and now widely practiced because it is a minimally invasive technique. The intentional ligation of internal iliac artery is also done in the treatment of endovascular repair of aortoiliac aneurysms. The iliac crest flap pedicled on the ilio-lumbar artery, a branch of posterior division of internal iliac artery, is being used as a reliable bone flap. A severe and potentially lethal complication in pelvic injuries is arterial bleeding commonly involving the branches of internal iliac artery, namely, the lateral sacral, ilio-lumbar, obturator, vesical and inferior gluteal arteries. Surgeons must also be conscious of unexpected sources of haemorrhage, such as from an aberrant obturator artery while dealing with direct, indirect inguinal, femoral or obturator hernias and take appropriate precautions to avoid injury to these vessels. Vascular variations have always been a subject of controversy as well as curiosity, because of their clinical significance[3].

The first attempt to group the variations in the origin of the parietal branches of the internal iliac artery into definite patterns was undertaken by Jastschinski and found that only the vessels in the first category showed sufficient regularity in origin to enable them to be grouped into definite types, of which he described four[4]. Adachi(1928) modified the method slightly, adding a fifth type of variation and included certain sub types, in a study of internal iliac artery and its branches in Japanese subjects[5]. His scheme is as follows:-

ADACHI types :

Type I : The superior gluteal artery arises separately from the internal iliac artery, and the inferior gluteal and internal pudendal vessels are

given off by a common trunk. If the latter divides within the pelvis it is considered to be type Ia, where as if the bifurcation occurs below the pelvic floor it is classified as type Ib.

Type II : The superior and the inferior gluteal arteries arise by a common trunk and the internal pudendal vessels separately. In this category, as in the previous one, two subtypes are described. Type IIa includes those specimens in which the trunk common to the two gluteal arteries divides within the pelvis and type IIb those in which the division occurs outside the pelvis.

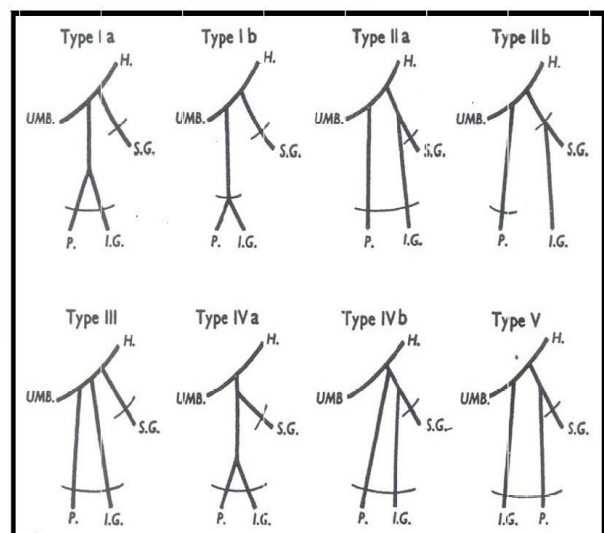
Type III : The three branches arise separately from the internal iliac artery.

Type IV : The three arteries arise by a common trunk. The sub typing is based on the sites of origin of the superior gluteal and the internal pudendal arteries from the parent stem. In type IVa, the trunk first gives rise to the superior gluteal artery before bifurcating into the other two branches. In type IVb, the internal pudendal is the first vessel to spring from the common trunk, which then divides into superior and inferior gluteal arteries.

Type V : The internal pudendal and the superior gluteal arteries arise from a common trunk and the inferior gluteal has a separate origin.(Figure 1)

Hence, the present work was undertaken to study the morphology of internal iliac artery.

Fig. 1:Adachi's types H- internal iliac artery; I.G- Inferior gluteal artery; P- Internal pudendal artery; S.G- Superior glutealartery; UMB - Umbilical artery.



MATERIALS AND METHODS

50 formalin fixed adult human pelvic halves were procured from the Department of Anatomy, J.J.M. Medical College and S.S.Institute of Medical Sciences and Research Centre, Davangere. Specimens were collected during routine dissection practicals conducted by the Department of Anatomy, J.J.M. Medical College and S.S.Institute of Medical Sciences and Research Centre, Davangere. A horizontal section through the abdomen at the fourth lumbar vertebral level was taken. The pelvic specimen thus obtained was divided into two equal halves by cutting through the pubic symphysis, the sacrum and coccyx. This section divided the bladder, (uterus and vagina in female) and rectum longitudinally. Then, the peritoneum was removed from the bladder, uterus (in female), rectum and the lateral pelvic wall of each half of the pelvis. The level of origin of internal iliac artery was noted, the length of the trunk of the vessel was measured. The level of its termination into anterior and posterior division was identified and noted. The occasional branches that were arising from the common trunk were dissected. The individual branches (parietal, visceral) arising from the anterior and posterior divisions were dissected upto their terminations inside the pelvis. A pattern of variation that have occurred at the level of origin and division of the main trunk, anomalous branches that have arised from both anterior and posterior divisions, any absence of definitive branches from the anterior and posterior division were noted.

Fig. 2: Showing internal iliac artery origin 1cm above greater sciatic foramen.

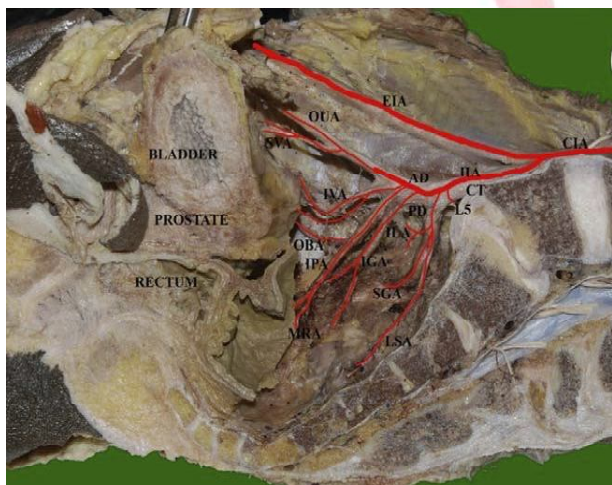
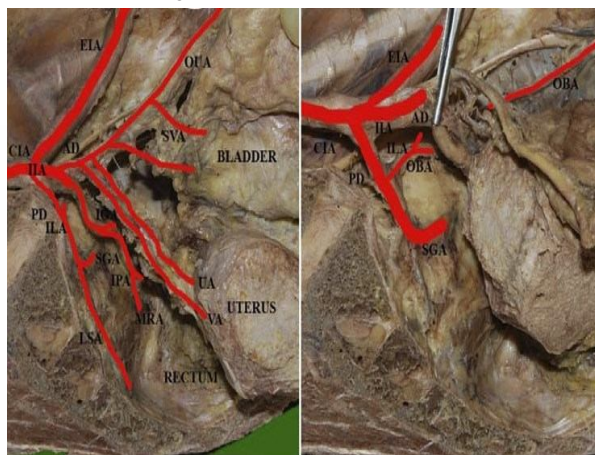


Fig. 3: Showing internal iliac artery origin 3cm above greater sciatic foramen.



RESULTS

In the present study of 50 pelvic halves, the most common site of origin of internal iliac artery was at the level of lumbo-sacral intervertebral disc found in 30 specimens (60%). Opposite L5 vertebra in 10 specimens (20%), at the level of L4 and L5 disc in 8 specimens (16%) and opposite S1 vertebra in 2 specimens (4%)(Table No 1).

Table No. 1: Origin of Internal Iliac Artery as Observed In 50 Specimens.

Origin	Specimen	Percentage(%)
B/W L4&L5	8	16
B/W L5&S1	30	60
Opp. L5	10	20
Opp. S1	2	4
Total	50	100

The length of internal iliac artery was found to be 3-5cm in 23 specimens (46%), 5-7 cm in 16 specimens (32%) and 1-3 cm in 11 specimens (22%), shortest being 1.5 cm and longest being 7 cm(Table No 2). The level of division of internal iliac artery took place above the greater sciatic foramen in 34 specimens (68%), at the upper border of greater sciatic foramen in 7 specimens (14%), and below the upper border of greater sciatic foramen in 9 specimens (18%)(Table No 3).

Table No. 2: Length of Internal Iliac Artery.

Length	Specimen	Percentage(%)
1--3 cm	11	22
3--5 cm	23	46
5--7 cm	16	32
Total	50	100

Table No. 3: Level of Division of Internal Iliac Artery.

Level of Division	Specimen	Percentage(%)
0.5cm Ab GSF	9	18
1 cm Ab GSF	9	18
1.5cm Ab GSF	4	8
2cm Ab GSF	9	18
2.5cm Ab GSF	2	4
3cm Ab GSF	1	2
At UB of GSF	7	14
0.5Bw UB GSF	4	8
1 Bw UB GSF	3	6
2 Bw UB GSF	2	4
Total	50	100

(Ab GSF = Above Greater Sciatic Foramen, UB GSF = Upper border of Greater Sciatic Foramen)

The common trunk of internal iliac artery did not give any branch in 22 specimens (44%), gave origin to vertebral branches in 15 specimens (30%), to ilio-lumbar artery in 9 specimens (18%), superior gluteal artery in 1 specimen (2%), lateral sacral artery in 2 specimens (4%), both ilio-lumbar artery and lateral sacral artery in 1 specimen (2%)(Table No 4).

Table No. 4: Branches given off by the common trunk of internal iliac artery.

Branches from common trunk	Specimen	Percentage (%)
Vertebral Brs	15	30
ILA	9	18
SGA	1	2
LSA	2	4
ILA & LSA	1	2
NIL	22	44
Total	50	100

(ILA = Ilio-lumbar Artery, SGA = Superior Gluteal Artery, LSA = Lateral Sacral Artery, NIL= No branches)

DISCUSSION

Arteries are essentially conducting channels through which blood is conveyed from the heart to the capillary bed. The blood vascular tree has at all times been a particularly interesting phase of anatomical study. Its influence on the development of the individual, its practical importance in medicine and the necessity for the surgeon to thoroughly orient himself with it, give additional stimuli to further our knowledge concerning it. The internal iliac artery is the "artery of the pelvis". It supplies most of the blood to the pelvic viscera; namely rectum, urinary bladder, prostate and seminal vesicle in

male, uterus in female and musculoskeletal part of the pelvis. However, it also supplies branches to the gluteal region, medial thigh region and the perineum including erectile tissues of the penis and the clitoris.

Since the variations in the origin of parietal branches of internal iliac artery are of great surgical importance and of academic interest to the anatomists, the present study was undertaken. In the present study a total of 50 adult human pelvic halves were taken and the origin, length, level of division, occasional branches if any from the common trunk, the branching pattern of internal iliac artery and its variations were observed. In the present study, the most common site of origin of internal iliac artery was at the level of lumbo-sacral intervertebral disc and the level of division of internal iliac artery was above the greater sciatic foramen in majority of the specimens. These observations correlate with the observations of Lipschutz[6].

In the present study, the length of internal iliac artery was found to be as short as 1.5cm and as long as 7cm, average length being 3-5cm observed in 23 specimens (46%). This correlate with the observations of Bleich AT[7] in which the average length of internal iliac artery was 27mm, Lipschutz[6] (3.5-4.5cm). These observations also correlate with the observations of Bergman[8] where the length was found to be as short as 1.2cm and as long as 7.5cm.

In the present study, though the basis of classification of branching pattern of internal iliac artery is mainly based on modified Adachi classification, it has been adopted with slight modifications. Adachi studied the branches of internal iliac artery both outside and inside the pelvis and classified the branches into types - Ia, Ib, IIa, IIb, III, IVa, IVb and V[5]. The present study is confined to the branches of internal iliac artery only inside the pelvis and is confined to types - Ia, IIa, III, IVa, IVband V. In the present study, Type Ia arrangement was found in 52% of the specimens, Type IIa in 2%, Type III in 34%, Type IV was not found in any of the specimens, Type V was found in 2% and 10% of the specimens could not be classified because of absence of inferior gluteal artery in them.

These observations correlate with the observations made by Braithwaite JL in which Type I arrangement was the most frequent finding, accounting for 58.5% of all the specimens, Type III in 22.5%, Type II in 15.3%, Type IV pattern was comparatively rare in only 3.6% of specimens and Type V was not found[9].

In a study conducted on 645 pelvic halves of Japanese cadavers by Yamaki K, it was observed that Type I arrangement was most frequently observed in 46.8% of the specimens[10]. In a study conducted on 167 pelvic halves of Caucasian bodies by Roberts WH, it was observed that there were no instances of the rare Type V[11].

CONCLUSION

The most common site of origin of internal iliac artery was at the level of lumbo-sacral intervertebral disc found in 30 specimens(60%). Average length of internal iliac artery was found to be 3-5cm in 23 specimens (46%).The level of division of Internal iliac artery took place above the greater sciatic foramen found in 34 specimens (68%). The common trunk of internal iliac artery gave origin to vertebral branches in 15 specimens (30%), other named branches (ilio-lumbar artery, superior gluteal artery and lateral sacral artery) in 13 specimens (26%) and did not give any branch in 22 specimens (44%). The branching pattern of internal iliac artery was classified as per modified Adachi classification. Type Ia arrangement was found in 52%, type III in 34%, type IIa and type V found in 2% each and type IV was not found in any of the specimens. The knowledge of internal iliac artery very helpful for surgeons specially in pelvic region.

Conflicts of Interests: None

REFERENCES

- [1]. Clark WEL. The tissues of the body. 5th ed., Oxford-Clarendon Press; 1965 .p.190-97.
- [2]. Moore KL. Clinically oriented anatomy. 4th ed., Baltimore, U.S.A : Williams and Wilkins; 1992 .p. 350-55.
- [3]. Pai MM, Krishnamurthy A, Prabhu LV, Pai MV, Kumar SA and Hadimani GA. Variability in the origin of the obturator artery. Clinics Basic Research 2009; 64(9): 897-901.
- [4]. Jastschinski S. Die typischen Verzweigungsformen der Arteria hypogastrica. Int Mschr Anat Physiol 1891;8:111-27.
- [5]. Adachi B. Das Arteriensystem der Japaner, Bd. II. Kyoto. Supp. To Acta Scholae Medicinalis Universitatis Imperialis in Kioto 1928;9:1926- 27.
- [6]. Lipschutz B. A composite study of the hypogastric artery and itsbranches. Ann Surg 1918; 67(5): 584-608.
- [7]. Bleich AT, Rahn DD, Wieslander CK, Wai CY, Roshanravan SM and Corton MM. Posterior division of internal iliac artery: anatomic variations and clinical applications. Am J Obstet Gynecol 2007;197(6):658.
- [8]. Bergman RA, Thompson SA, Afifi AK and Saadeh FA. Compendium of human anatomic variation. Baltimore and Munich : Urban and Schwazenberg; 1988 .p.84-85.
- [9]. Braithwaite JL. Variations in origin of the parietal branches of theinternal iliac artery. J Anat Soc of India 1952; 86: 423-30.
- [10]. Yamaki K, Saga T, Doi Y, Aida K and Yoshizuka M. A statistical study of the branching of the human internal iliac artery. Kurume Med J 1998; 45(4): 333-40.
- [11]. Roberts WH, Krishingner GL. Comparative study of human internal iliac artery based on adachi Classification. The Anatomical Record 2005;158(2):191-96.

How to cite this article:

Pavan P Havaldar, Sameen Taz, Angadi A.V, Shaik Hussain Saheb. MORPHOLOGICAL STUDY OF INTERNAL ILIAC ARTERY. Int J Anat Res 2014;2(2):358-62.